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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
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in its capacity as elected Office

Date of mailing (day/month/year) 27 February 2001 (27.02.01)	
International application No. PCT/US00/10563	**Applicant's or agent's file reference** GIC-573 PCT
International filing date (day/month/year) 19 April 2000 (19.04.00)	**Priority date** (day/month/year) 30 April 1999 (30.04.99)
Applicant BOOTH, Robert, Charles	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

30 November 2000 (30.11.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Juan Cruz
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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference GIC-573 PCT	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US00/10563	International filing date *(day/month/year)* 19 APRIL 2000	Priority date *(day/month/year)* 30 APRIL 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): G06F 15/173 and US Cl.: 709/238		
Applicant GENERAL INSTRUMENT CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets.

   ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 0 sheets.

3. This report contains indications relating to the following items:

   I ☒ Basis of the report

   II ☐ Priority

   III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability

   IV ☐ Lack of unity of invention

   V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   VI ☒ Certain documents cited

   VII ☐ Certain defects in the international application

   VIII ☐ Certain observations on the international application

Date of submission of the demand 30 NOVEMBER 2000	Date of completion of this report 20 FEBRUARY 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer Peggy Harrod JOHN FOLLANSBEE Telephone No. (703) 305-8498

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/10563

I. Basis of the report

1. With regard to the **elements** of the international application:*

[X] the international application as originally filed

[X] the description:
pages 1-19, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____

[X] the claims:
pages 20-29, as originally filed
pages NONE, as amended (together with any statement) under Article 19
pages NONE, filed with the demand
pages NONE, filed with the letter of _____

[X] the drawings:
pages 1-9, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____

[X] the sequence listing part of the description:
pages NONE, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

[ ] the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

[ ] the language of publication of the international application (under Rule 48.3(b)).

[ ] the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

[ ] contained in the international application in printed form.

[ ] filed together with the international application in computer readable form.

[ ] furnished subsequently to this Authority in written form.

[ ] furnished subsequently to this Authority in computer readable form.

[ ] The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] The statement that the information recorded in computer readable form is identical to the writen sequence listing has been furnished.

4. [X] The amendments have resulted in the cancellation of:

[X] the description, pages NONE

[X] the claims, Nos. NONE

[X] the drawings, sheets/~~fig~~ NONE

5. [ ] This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

***Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/10563

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)	Claims	1-49	YES
	Claims	NONE	NO
Inventive Step (IS)	Claims	1-49	YES
	Claims	NONE	NO
Industrial Applicability (IA)	Claims	1-49	YES
	Claims	NONE	NO

2. citations and explanations (Rule 70.7)

Claims 1-49 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest the claimed subject matter.

---------- NEW CITATIONS ----------

NONE

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication Date *(day/month/year)*	Filing Date *(day/month/year)*	Priority date (valid claim) *(day/month/year)*
US, A, 6,172,980	09 JANUARY 2001	11 SEPTEMBER 1997	NONE
US, A, 6,192,491	20 FEBRUARY 2001	11 AUGUST 1998	15 JUNE 1998
US, A, 6,181,694	30 JANUARY 2001	03 APRIL 1998	NONE
US, A, 6,173,316	09 JANUARY 2001	08 APRIL 1998	NONE
US, A, 6,108,345	22 AUGUST 2000	30 MAY 1997	NONE

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure *(day/month/year)*	Date of written disclosure referring to non-written disclosure *(day/month/year)*

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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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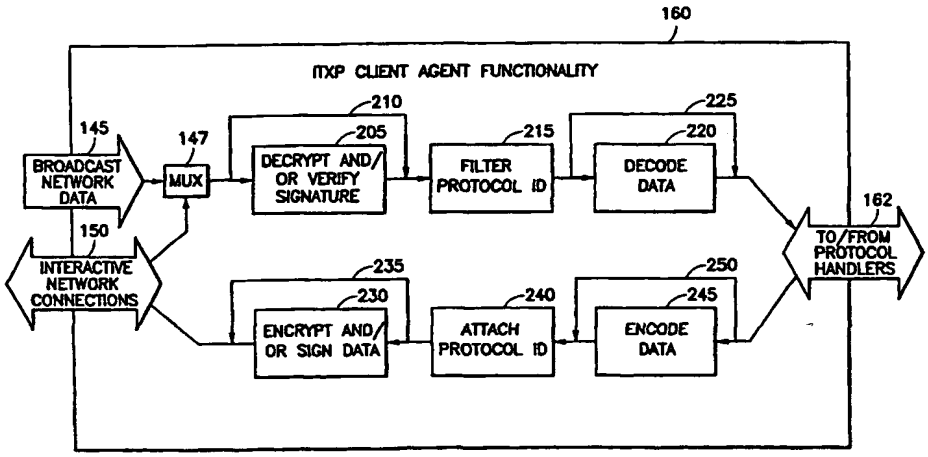
(54) Title: METHOD AND APPARATUS FOR COORDINATING AND FILTERING ON INTERACTIVE AND BROADCAST PROTOCOLS IN BROADBAND NETWORK ENVIRONMENTS



(57) Abstract

A protocol agent (135, 160) for a broadband communication network accommodates data that is provided using different protocols. Data is received from protocol handlers (130, 165) at a client (115) or server (105). An identifier (565, 682) is attached (240, 315) to the data (570, 684), to identify the protocol thereof, whether encoding was applied and, if so, which type, and whether encryption/signing was applied and, if so, which type. The data with the attached identifier is communicated, e.g., from a client (115) to a server (105), or from a server (105) to a client (115). Available communication paths include one–way, e.g., broadcast or multicast (462, 465, 470), or dedicated upstream path (475), and two–way, e.g., an interactive path such as a computer network or telephone link (485) using TCP or UDP, or a cable television upstream path (480). At the receiving end, the protocol identifier (565, 682) is filtered (215, 340) to apply decryption/signature verification, and/or decoding, and to forward the data to an appropriate counterpart protocol handler (130, 165).

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METHOD AND APPARATUS FOR COORDINATING AND FILTERING ON INTERACTIVE AND BROADCAST PROTOCOLS IN BROADBAND NETWORK ENVIRONMENTS

BACKGROUND OF THE INVENTION

This application claims the benefit of U.S. Provisional Application No. 60/131,807, filed April 30, 1999.

The present invention relates to broadcast and interactive multimedia and secure E-commerce, and particularly to such features provided by cable television set-top terminals and systems.

The following acronyms and terms are used:

ASIC - Application Specific Integrated Circuit

ATM - Asynchronous Transfer Mode

CD - Compact Disc

CMTS - Cable Modem Termination System

CPS - Cable Proxy Server

CRC - Cyclic Redundancy Check

DES - Data Encryption Standard

DOCSIS - Data-Over-Cable Service Interface Specifications

DSL - Digital Subscriber Loop

DVD - Digital Video Disk

E - Encrypted

EPG - Electronic Program Guide

GIF - Graphical Interchange Format

HMTP - Hypermedia Transfer Protocol

HTML - Hyper Text Markup Language

HTTP - Hyper Text Transport Protocol

HVML - Hyper Video Markup Language
ID - Identifier
IP - Internet protocol
IRD - Integrated Receiver-Decoder
IRT - Integrated Receiver Transcoder
ITXP - Interactive Transport Protocol
JPEG - Joint Photographic Experts Group
MAC - Medium Access Control
MPEG - Moving Picture Experts Group
MPS - Modular Processing System
NC - Network Controller
OM - Out-of-band Modulator
PC - Personal Computer
PID - Packet Identifier
PDU - Protocol Data Unit
RF - Radio Frequency
RPD - Return Path Demodulator
TCP - Transmission Control Protocol
TELCO - Telephone Company
UDP - User Datagram Protocol
UHTTP - Unidirectional HyperText Transport Protocol
VBI - Vertical Blanking Interval
VCR - Video Cassette Recorders
VOD - Video On Demand
VRL - Virtual Resource Locator
WWW - World Wide Web

A set-top terminal, also referred to as an IRD or a subscriber terminal, is a device that receives and decodes television signals for presentation by a television. The signals can be delivered over a satellite, through a cable plant, by means of terrestrial broadcast, and/or via a computer network

such as the Internet.

Recently, there has been a trend to incorporate additional features and capabilities into conventional broadband networks. These features include VOD, pay-per-view, interactive shopping, electronic commerce, Internet connectivity and Internet-based telephony. In particular, the development of cable modems has enabled computer network resources, such as Internet resources, to be integrated into television networks.

However, the provision of both interactive and broadcast data in a broadband network raises various issues, including the need for compatibility with different communication protocols, and the need to optimize available bandwidth.

Accordingly, it would be desirable to provide a system that addresses the above and other issues.

The system should be usable, e.g., in wireless, satellite, cable, or any telecommunication system. More particularly, the system should be usable with all digital set-top terminals, or any device that supports video, audio, or WWW content (e.g., a personal computer, network computers, VCRs, DVD players, CD players, IP telephones, video phones, web phones, etc.). Such devices may be connected, either directly or indirectly, to a broadband network.

The system should provide a common mechanism for coordinating and routing interactive and broadcast protocol data using all available data pipes within a network. This includes analog VBI data channels, Out-of-Band and In-band downstream data channels, such as those using the MPEG or similar DigiCipher II standard, proprietary to the assignee hereof, upstream channels, such as those using a random access contention protocol

such as ALOHA, and two-way communications, such as those using DOCSIS (for cable modems) or a telephone link (for telco modems).

The system should coordinate broadcast and interactive data, such as video data, and Internet data such as WWW content, on devices connected to a network.

The system should ensure the privacy of end user data requests and responses between end-user terminals, proxy servers, and origin servers.

The system should optimize the use of a cable operator's upstream and downstream network bandwidth.

The system should reduce the cost of supporting new services in set-top terminals.

The system should improve upon existing solutions that use currently defined industry standard TCP/IP protocols and HTTP message formats for handling server requests and responses on broadband networks.

The present invention provides a system having the above and other advantages.

SUMMARY OF THE INVENTION

In accordance with the present invention, an Interactive Transport Protocol (ITXP) is provided to establish a baseline framework for message handling in communication networks, e.g., such as broadband networks. For example, the invention can be used in connection with set-top terminals for cable television, satellite television, wireless, Ethernet, Firewire, twisted pair, infrared, or ATM/xDSL services. A common mechanism is disclosed for coordinating and routing interactive and broadcast protocol data using existing data pipes within broadband networks, including out-of-band and in-band downstream data channels, upstream channels, cable modem two-way communications, and analog VBI data.

Currently there is a need to coordinate broadcast and interactive video and internet data on devices connected to broadband networks. Examples of such devices include: 1) broadcast only digital set-top terminals using MPEG-2 transport or 2) interactive digital set-top terminals authorized to use DOCSIS cable modems, ALOHA upstream capabilities, or a telephone modem, in addition to using MPEG-2 transport. The present invention allows existing broadcast only or interactive digital set-top terminals to support web protocols, such as HTTP.

In addition, the invention provides the flexibility to enable new or future protocol definitions to meet the demands of the broadband networks. One such example is the Hypermedia Transfer Protocol (HMTP), proprietary to the assignee hereof. HMTP more effectively handles the coordination of broadcast and interactive video content

on broadband networks than existing protocols such as HTTP.

The invention also addresses the current need in broadband cable network environments to ensure the privacy of end user data requests and responses between end-user terminals, proxy servers, and origin servers. The present invention allows various encryption mechanisms to be applied to data content protocols such as HTTP and HMTP and the content that is carried within those protocols. For example, the well known DES, as well as public, private and single key systems can be used for such encryption.

Additionally, the invention optimizes the use of a cable operator's upstream and downstream network bandwidth by providing a mechanism for allowing various encoding schemes to be applied to application level protocols (i.e., data content protocols) such as HTTP and HMTP.

Moreover, the invention reduces the cost of supporting new services in set-top terminals. Current plans for enhanced digital set-tops generally include cable modem hardware chips, an additional tuner, and TCP/IP software consuming memory in the terminal. The present invention provides a mechanism wherein, if the required functionality is to support the HTTP protocol in the terminal (or a more efficient protocol producing the same results), additional hardware as listed above is not required in the terminal. This reduces the cost of deploying such systems.

The system improves upon existing solutions that are all using currently defined industry standard TCP/IP protocols and HTTP message formats for handling server requests and responses on broadband networks. The novel

approach of the present invention provides a more efficient and flexible mechanism for supporting the HTTP protocol, or other data content protocols such as HMTP.

The invention:

1. Provides the framework for a new, very scaleable broadband proxy server, such as, for example, a headend Cable Proxy Server (CPS);

2. Defines an efficient mechanism for allowing the encryption and decryption of interactive and broadcast protocol data in various broadband networks, thereby allowing cable operators to deploy secure interactive and broadcast data solutions, such as encrypted broadcast web pages, secure e-commerce transactions, and secure e-mail on their broadband networks. A per-transaction licensing fee for use of the secure e-commerce transaction mechanism can be provided;

3. Defines a mechanism that allows interactive and broadcast messages, such as Hypertext Transfer Protocol (HTTP), to be encoded in a manner that preserves network bandwidth. In addition, this mechanism reduces the processing power and memory required in end-user terminals/devices, proxy servers, and origin data servers to handle such messages. This, in turn, provides more attractive and cost effective solutions to cable operators; and

4. Defines a mechanism that can be implemented in either software or in an efficient and cost effective hardware application specific integrated circuit (ASIC) to handle the processing of this novel functionality in client and server devices.

In a specific embodiment, a sending client or server agent receives input data and processes it in some manner to provide output data. As a minimum, the

agent attaches an identifier to the output data to designate the protocol in which it is provided. The protocol of the output data may be unchanged from that of the input data. Or, the agent may encode the input data to change its protocol, in which case the identifier designates the encoding that was applied. The agent may also apply encryption/signing to the input data, in which case the identifier designates the encryption/signing that was applied.

At a receiving client or agent server, the attached information is examined to determine which counterpart operations should be performed to recover the data in the same condition in which it was input to the sending client or server agent. The recovered data can then be routed to the appropriate protocol handler.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a high level overview of the ITXP framework used within a digital network in accordance with the present invention.

FIG. 2 illustrates the ITXP client agent functional elements in accordance with the present invention.

FIG. 3 illustrates the ITXP server agent functional elements in accordance with the present invention.

FIG. 4 illustrates an example broadband cable configuration capable of supporting ITXP in accordance with the present invention.

FIG. 5 illustrates an example of how ITXP messages can be delivered over an MPEG-2 private data stream in accordance with the present invention.

FIG. 6 illustrates an example of how ITXP messages can be delivered over a DOCSIS-based TCP/IP socket connection in accordance with the present invention.

FIG. 7 illustrates example data paths within an ITXP enabled client connected to a broadband cable network in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to an Interactive Transport Protocol (ITXP) for message handling in communication networks.

Since the invention is network independent, as new mechanisms for transporting data across cable plants are deployed, the content developed using the invention can simply be re-directed over any new digital data paths established. The invention can be implemented using software written for existing hardware, or an ASIC for handling the processing of this novel functionality in client and server devices, which may be a more efficient and cost-effective approach.

Moreover, as mentioned, a DOCSIS cable modem, additional tuner, and/or TCP/IP software stack are not required to implement the invention. However, additional tuners, MPEG packet processors, and cable modems make the invention much more flexible. Enhancements to both hardware and software can improve the performance of this functionality, e.g., such as building a dedicated hardware ASIC to support the ITXP protocol format may result in a more efficient and cost effective solution.

The invention can be used as a standard to define how a browser on a PC can access video and audio content via a cable television network (or other information network) through the use of a digital video PC card, a cable modem or any in-home network connected to a set-top terminal. Likewise, any device can use the invention to more efficiently process HTTP (or HMTP) requests and responses. For example, a video phone can use the invention to send a request to establish a video

conferencing session through a cable network via a physical connection to a set-top terminal or a cable modem. Other examples include VCRs, DVD players, stereo tuners, CD players, flat panel televisions, etc., that can all use the invention for more efficiently processing HTTP (or HMTP) requests and responses.

Since the invention is network independent, it allows more efficient use of network bandwidth via telephone modem connections, xDSL connections, IEEE 802.3 (Ethernet) networks, etc.

In addition, existing Internet Proxy and Origin Servers can be updated to support the ITXP protocol on a well-defined IP port number. This, in turn, enables the servers to support 1) any efficient encoded formats of application protocols, such as encoded HTTP or encoded HMTP, resulting in the support of more end users, or 2) any encryption and decryption mechanisms that can be applied to the application protocols and/or the data encapsulated within these protocols.

ITXP provides a baseline framework for message handling in broadcast and interactive environments. The figures illustrate how ITXP can be used in digital networks, specifically broadband digital cable networks. In addition, diagrams are included showing the internal functional elements within the ITXP layers.

FIG. 1 provides a high level overview of the ITXP framework used within a digital network. The ITXP functional model 100 consists of three major network components that distribute content between content providers and content users. The network components include digital network servers 105, a digital network 110, and digital network clients 115.

The server component 105 includes an example

content provider 120, a content handler 125, protocol handlers 130 that are compatible with different communication protocols, an ITXP server agent 135, a path 132, and a broadcast data streaming function 140.

The network component 110 includes a broadcast path 145 for broadcast network data, and a two-way path 150 for interactive network connections.

The client component 115 includes a broadcast data stream handler 155, an ITXP client agent 160, protocol handlers 165, a path 162, content handlers 170, and a content user 175.

The ITXP client agent 160 can receive data from either the broadcast network connections 145, the interactive network connections 150, or client-side protocol handlers 165.

FIG. 2 shows the functional elements of the ITXP client agent 160 of FIG. 1.

Like-numbered elements correspond to one another in the figures. The ITXP client agent 160 includes a decrypt and/or verify signature functions 205 with a bypass path 210, a filter protocol ID function 215, and a decode data function 225 with a bypass path 225. An encrypt and/or sign data function 230 with a bypass path 235, attach protocol ID function 240, and an encode data function 245 with bypass path 250 are also provided.

If data is received from either the broadcast path 145 or the interactive network connections 150 via a mux 147, the filter protocol ID function 215 filters on a protocol identifier within the ITXP header in the data to determine which protocol handler 165 must be used to process the data. In addition, the ITXP client 160 may decode encoding formats at decoder function 220, or decrypt encryption schemes and/or verify any digital

signatures applied to some or all of the data at decrypt/verify function 205 before handing the data off for processing by an appropriate protocol handler 165.

Analogously, if data is received from a protocol handler via path 162, the ITXP client agent 160 identifies the protocol handler that passed the data to it by attaching a protocol identifier within an ITXP header at attach protocol ID function 240 before transmitting the data across the interactive network connection 150. Optionally, the ITXP client 160 may encode the data at encode function 245, or encrypt and/or apply a digital signature to some or all of the data at encrypt/sign function 230 before continuing with transmission across the interactive network 150.

Appropriate control techniques, including switches and the like, can be used to route the data via the bypass paths 210, 225, 235 and 250.

FIG. 3 shows the functional elements of the ITXP server agent 135 of FIG. 1.

The ITXP server agent 135 includes a decrypt and/or verify signature functions 345 with a bypass path 350, a filter protocol ID function 340, and a decode data function 330 with a bypass path 335. An encrypt and/or sign data function 320 with a bypass path 325, attach protocol ID function 315, and an encoder data function 305 with bypass path 310 are also provided.

The ITXP server agent 135 can send data to the broadcast network connections 145, interactive network connections 150, or server-side protocol handlers 130. The ITXP server agent 135 can also receive data from interactive network connections 150 or from the server-side protocol handlers 130 via path 132.

If data is received from the interactive network

connection 150, the filter protocol ID function 340 filters on a protocol identifier (ID) within the ITXP header of the data to determine which protocol handler 130 must be used to process the data. In addition, the ITXP server agent 135 may decode encoding formats at the decode data function 330, or decrypt encryption schemes and/or verify any digital signatures applied to some or all of the data at the decrypt/verify function 345 before handing the data off for processing by a server-side protocol handler.

If data is received from a server-side protocol handler, the attached protocol ID function 315 identifies the protocol handler that passed the data to the ITXP server agent 135 by attaching a protocol ID within an ITXP header of the data before transmitting the data across the broadcast path 145 or interactive network connections 160 to the client. In addition, the ITXP server agent 135 may encode the data at the encode data function 305, or encrypt and/or apply a digital signature to some or all of the data at the encrypt/sign function 320 before continuing with transmission across the broadcast path 145 or interactive network connections 150 via a demux 327.

Appropriate control techniques, including switches and the like, can be used to route the data via the bypass paths 310, 325, 335 and 350.

FIG. 4 shows a broadband cable network configuration 400 that is capable of supporting ITXP.

The configuration 400 includes a CPS 425 that communicates, for example, with a controller 405, an EPG data function 410, WWW and other Internet servers 415, and other ITXP-capable servers 420.

The CPS 425 also communicates with example headend

components, including, for example, a VBI data insertion function 427, an IRT 430, a MPS 435, an OM 440, a NC 445, an RPD 450, a CMTS 455, and a modem bank 460. The VBI data insertion function 427 provides VBI data 462 downstream. The IRT 430 and MPS 435 provide downstream in-band MPEG data streams 465 to an example digital cable terminal 490 in a terminal population, and optionally to other in-home network devices 495. The MPS 435 is also known as a broadcast data router or in-band data router. The ITXP client agent 160 can be provided in the terminal 490. The OM 440 provides downstream out-of-band MPEG data streams 470 to the terminal 490.

For upstream communications, the RPD 450 receives ALOHA upstream data 475 from the terminal 490.

For bi-directional communications, the CMTS sends/receives DOCSIS data 480, and the modem bank 460 sends/receives telco data 485, e.g., in a conventional telephone link.

Within a broadband cable environment, the ITXP server agent 135 may exist within the CPS 425, and the ITXP client agent 160 may be present within the digital cable terminals 490. However, the digital cable terminals 490 may also include an ITXP server agent to support other ITXP-capable in-home network client devices. The term "digital cable terminal" or the like in this context represents any device that can be connected to a cable head-end via a RF connection.

In a typical mode of operation, the CPS 425, containing the ITXP server agent 135, delivers ITXP messages to digital cable terminals via MPEG-2 transport streams (e.g., streams 465 and 470), UDP/IP socket connections, or TCP/IP socket connections.

FIG. 5 shows an example of how ITXP messages can be delivered over an MPEG-2 private data stream.

An example 188-byte MPEG packet 500 includes a sync field 505, a PID 510, scrambling, adaptation and continuity fields 515, and a payload 520. A number of transport packets 530 are shown including packets 535, 540 and 545. An MPEG-2 private data stream 550 is constructed from the number of transport packets 530 and includes a HYPER MEDIA Message type 555, a first field 560 for private message information, an ITXP message field 565, a field 570 for HTTP/HMTP/UHTTP, etc., a field 575 for data, graphics, audio, video, etc., another field for private information 580, and a CRC field 585.

The example uses a new HYPER MEDIA message type (field 555) that indicates that the following data (field 565) may include an ITXP message, such as an ITXP header that specifies a protocol ID of the application protocol that follows in the message, and/or a type of encoding applied by an ITXP server agent or client agent, and/or a type of encryption/signing applied by an ITXP server agent or client agent, as discussed previously. For example, the ITXP message 565 identifies one of several supported application level data protocols 570 (e.g. HTTP, HMTP, UHTTP or any other application protocol). In this case, A HYPER MEDIA message can be sent to a terminal via any device capable of delivering MPEG-2 transport packets, either in-band or out-of-band. For example, HYPER MEDIA messages can be sent from the CPS 425 of FIG. 4 to the OM 440, IRT 430, or MPS 435 as MPEG-2 packets. Each device (OM, IRT, or MPS) inserts the MPEG-2 packets that make up the HYPER MEDIA message into the particular broadband

multiplex managed by that device.

FIG. 6 shows an example of how ITXP messages can be delivered over a DOCSIS-based TCP/IP socket connection.

A 188-byte MPEG packet 600 includes the fields 505, 515 and 520 discussed previously, along with a DOCSIS PID (with the value 0x1FFE) field 510. A number of transport packets 630 are shown including packets 632, 634 and 636. A DOCSIS MAC frame 640 includes a header 642 and a packet PDU 644. An Ethernet-type PDU 650 includes a destination address 652, a source address 654, a type/length field 656, and a user data field 658, which may be from, e.g., 0 to 1500 bytes. An IP layer 660 includes an IP header 662 and IP data 664, such as a TCP segment.

A TCP layer 670 includes a TCP header 672 and TCP data 674. Lastly, the TCP data 674 includes an ITXP field 682, such as an ITXP header that includes information for designating the protocol ID, encoding, and/or encryption/signing status of the protocol data present in field 684 (i.e. HTTP, HMTP, or UHTTP), a HTTP/HMTP/UHTTP field 684, and a field 688 for data, graphics, audio, video, etc. The ITXP message 682 thus identifies the data 684 as being provided according to an HTTP, HMTP, UHTTP or other protocol. The ITXP message may further designate, if applicable, what type of encoding and encryption/signing was applied to the data that is input to a client or server agent.FIG. 7 shows example data paths within an ITXP enabled client agent 760 connected to a broadband cable network.

The agent 760 includes a VBI data processor 762, in-band MPEG packet processors 765, out-of-band MPEG packet processors 770, ALOHA upstream data processors, a DOCSIS cable modem 780, and a Telco Modem 785. An ITXP

processor/switch 715 communicates with a HYPER MEDIA message function 705 and a TCP/IP function 710. The ITXP processor/switch 715 routes data to, and receives data from any one or more of a number of protocol functions, such as an HTTP function 720, an E-HTTP function 722, an HMTP function 724, an E-HMTP function 726, a UHTTP function 728, and a reserved function 730 for future needs. UHTTP refers to uni-directional (downstream) HTTP. The TCP/IP function 710 can also communicate with any one of these functions 720-730 directly.

The functions 720-730, in turn, can communicate with any one or more of applications functions, including an HTML function 732, an E-HTML function 734, an HVML function 736, an E-HVML function 738, a JPEG function 740, a GIF function 742, Java Applets 744, and any other desired functions 746.

Accordingly, it can be seen that the present invention provides a mechanism for coordinating and routing interactive (two-way), broadcast (downstream), and upstream protocol data. The interactive data may be provided, e.g., via a cable modem or a telephone company modem. The cable modem may operate according to the DOCSIS protocol. Moreover, both the cable modem and telco modem may communicate using the TCP/IP protocol, such as is commonly used to communicate Internet data. The broadcast data may be provided, e.g., as in-band and/or out-of-band MPEG data streams, or as analog VBI data. The upstream data may be provided, e.g., using the ALOHA network contention protocol.

Furthermore, the invention uses existing data paths within broadband networks.

Optionally, the invention can be used in

transferring data, e.g., via a data queue between two processes on the same device or machine.

Although the invention has been described in connection with various specific embodiments, those skilled in the art will appreciate that numerous adaptations and modifications may be made thereto without departing from the spirit and scope of the invention as set forth in the claims.

What is claimed is:

1. A protocol agent apparatus in a communication system, comprising:

means for receiving input data from at least one protocol handler;

means for processing the input data to provide corresponding output data according to a desired data protocol;

wherein said processing means comprises means for attaching at least one identifier to the output data to identify the desired data protocol thereof; and

means for providing the output data with the at least one attached identifier to at least one client or server via the system.

2. The apparatus of claim 1, wherein:

said processing means comprises means for encoding the input data to provide it in the desired data protocol;

wherein the desired data protocol differs from a protocol in which the input data is provided from the protocol handler.

3. The apparatus of claim 2, wherein:

said processing means comprises means for bypassing said encoding means when the desired data protocol corresponds to the protocol in which the input data is provided from the protocol handler.

4. The apparatus of claim 2, wherein:

the at least one attached identifier further

designates the protocol in which the input data is provided from the protocol handler.

5. The apparatus of claim 1, wherein said processing means comprises:

means for encrypting and/or signing the input data;

wherein the attaching means attaches at least one identifier to the output data to identify the encryption and/or signing that was applied.

6. The apparatus of claim 5, wherein:

said processing means comprises means for bypassing said encrypting and/or signing means.

7. The apparatus of claim 1, wherein:

the protocol handler is provided at a server; and

the output data with the at least one attached identifier is provided to at least one client.

8. The apparatus of claim 7, wherein:

the output data with the at least one attached identifier is provided to the at least one client using at least one of a unidirectional protocol and a bi-directional protocol.

9. The apparatus of claim 8, wherein:

the at least one of a unidirectional protocol and a bi-directional protocol is provided via an out-of-band downstream data channel of a network.

10. The apparatus of claim 8, wherein:

the at least one of a unidirectional protocol and a bi-directional protocol is provided via an in-band

downstream data channel of a network.

11. The apparatus of claim 7, wherein:
the output data with the attached identifier is provided to the at least one client using one of broadcast, multicast, and single-cast communication.

12. The apparatus of claim 11, wherein:
the protocol of the broadcast, multicast, or single-cast communication uses a packetized transport stream standard.

13. The apparatus of claim 11, wherein:
the protocol of the broadcast, multicast, or single-cast communication uses an analog vertical blanking interval of a television signal to carry the output data.

14. The apparatus of claim 11, wherein:
the protocol of the broadcast, multicast, or single-cast communication carries the output data using at least one of: a User Datagram Protocol (UDP), a Transmission Control Protocol (TCP), and an Internet Protocol (IP).

15. The apparatus of claim 1, wherein:
the protocol handler is provided at a client; and the
the output data with the at least one attached identifier is provided to at least one server.

16. The apparatus of claim 15, wherein:
the output data with the at least one attached

identifier is provided to the server using at least one of a unidirectional protocol and a bi-directional protocol.

17. The apparatus of claim 15, wherein:

the output data with the at least one attached identifier is provided to the server using one of broadcast, multicast, and single-cast communication.

18. The apparatus of claim 17, wherein:

the broadcast, multicast, or single-cast communication carries the output data using at least one of: a User Datagram Protocol (UDP), a Transmission Control Protocol (TCP), and an Internet Protocol (IP).

19. The apparatus of claim 15, wherein:

the output data is provided according to at least one of a cable modem standard and a telephone system standard.

20. The apparatus of claim 15, wherein:

the output data is provided according to a random network contention standard.

21. The apparatus of claim 15, wherein:

the client comprises a subscriber terminal.

22. The apparatus of claim 1, wherein:

the system comprises at least one of a broadband cable, satellite, wireless, Asynchronous Transfer Mode (ATM), and a Digital Subscriber Loop (DSL) communication network.

23. The apparatus of claim 1, wherein:

the attaching means provides the at least one attached identifier in a header associated with the output data.

24. The apparatus of claim 1, wherein:

the attaching means provides the at least one attached identifier in a header associated with packets of the output data.

25. A protocol agent apparatus in a communication system, comprising:

means for receiving input data with at least one attached identifier via the system from at least one client or server;

wherein the at least one attached identifier identifies a protocol of the received input data;

means for processing the input data to provide corresponding output data according to a desired data protocol;

wherein said processing means comprises means for filtering the input data according to the at least one attached identifier to route the input data to a protocol handler for processing thereat in accordance with the desired data protocol.

26. The apparatus of claim 25, wherein:

said processing means comprises means for decoding the input data to provide it according to the desired data protocol;

wherein the desired data protocol differs from the protocol in which the input data is provided.

27. The apparatus of claim 26, wherein:

said processing means comprises means for bypassing said decoding means when the desired data protocol corresponds to the protocol in which the input data is provided.

28. The apparatus of claim 25, wherein:

at least one further identifier is attached to the input data to identify encryption and/or signing that was applied thereto; and

said processing means further comprises means for decrypting and/or verifying a signature of the input data according to the at least one further identifier.

29. The apparatus of claim 28, wherein:

said processing means comprises means for bypassing said means for decrypting and/or verifying a signature means.

30. The apparatus of claim 25, wherein:

the protocol handler is provided at a client; and

the input data with the at least one attached identifier is received from a server.

31. The apparatus of claim 30, wherein:

the input data with the at least one attached identifier is received from the server using at least one of a unidirectional protocol and a bi-directional protocol.

32. The apparatus of claim 31, wherein:

the at least one of a unidirectional protocol and a bi-directional protocol is provided via an out-of-band

downstream data channel of a network.

33. The apparatus of claim 31, wherein:

the at least one of a unidirectional protocol and a bi-directional protocol is provided via an in-band downstream data channel of a network.

34. The apparatus of claim 30, wherein:

the input data with the at least one attached identifier is received from the server using one of broadcast, multicast, and single-cast communication.

35. The apparatus of claim 34, wherein:

the broadcast, multicast, or single-cast communication uses a packetized transport stream standard.

36. The apparatus of claim 34, wherein:

the broadcast, multicast, or single-cast communication uses an analog vertical blanking interval of a television signal to carry the input data.

37. The apparatus of claim 34, wherein:

the protocol of the broadcast, multicast, or single-cast communication carries the at least one attached identifier using at least one of: a User Datagram Protocol (UDP), a Transmission Control Protocol (TCP), and an Internet Protocol (IP).

38. The apparatus of claim 25, wherein:

the protocol handler is provided at a server; and

the input data with the at least one attached identifier is received from a client.

39. The apparatus of claim 38, wherein:

the input data with the at least one attached identifier is received from the client using at least one of a unidirectional protocol and a bi-directional protocol.

40. The apparatus of claim 38, wherein:

the input data with the at least one attached identifier is received from the client using one of broadcast, multicast, and single-cast communication.

41. The apparatus of claim 40, wherein:

the broadcast, multicast, or single-cast communication carries the input data using at least one of: a User Datagram Protocol (UDP), a Transmission Control Protocol (TCP), and an Internet Protocol (IP).

42. The apparatus of claim 38, wherein:

the input data is provided according to at least one of a cable modem standard and a telephone system standard.

43. The apparatus of claim 38, wherein:

the input data is provided according to a random network contention standard.

44. The apparatus of claim 25, wherein:

the client comprises a subscriber terminal.

45. The apparatus of claim 25, wherein:

the system comprises at least one of a broadband cable, satellite, wireless, Asynchronous Transfer Mode

(ATM), and a Digital Subscriber Loop (DSL) communication network.

46. The apparatus of claim 25, wherein:

the at least one attached identifier is provided in a header associated with the input data.

47. The apparatus of claim 25, wherein:

the at least one attached identifier is provided in a header associated with packets of the input data.

48. A method for providing a protocol agent in a communication system, comprising the steps of:

receiving input data from at least one protocol handler;

processing the input data to provide corresponding output data according to a desired data protocol;

wherein the processing comprises attaching at least one identifier to the output data to identify the desired data protocol thereof; and

providing the output data with the at least one attached identifier to at least one client or server via the system.

49. A method for providing a protocol agent in a communication system, comprising the steps of:

receiving input data with at least one attached identifier via the system from at least one client or server;

wherein the at least one attached identifier identifies a protocol of the received input data;

processing the input data to provide corresponding output data according to a desired data protocol;

wherein the processing comprises filtering the input data according to the at least one attached identifier to route the input data to a protocol handler for processing thereat in accordance with the desired data protocol.

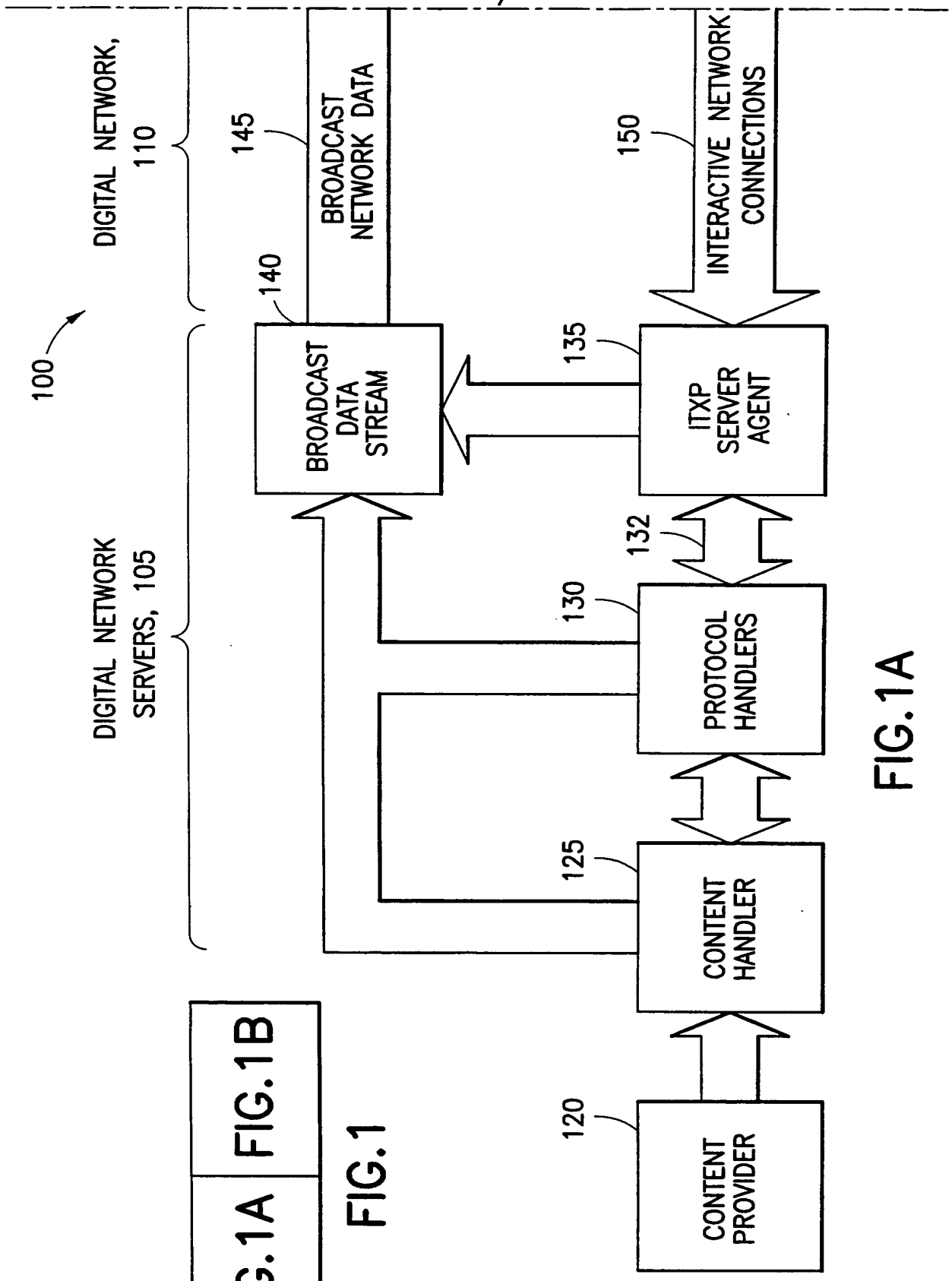

FIG. 1A

FIG. 1

FIG. 1A | FIG. 1B

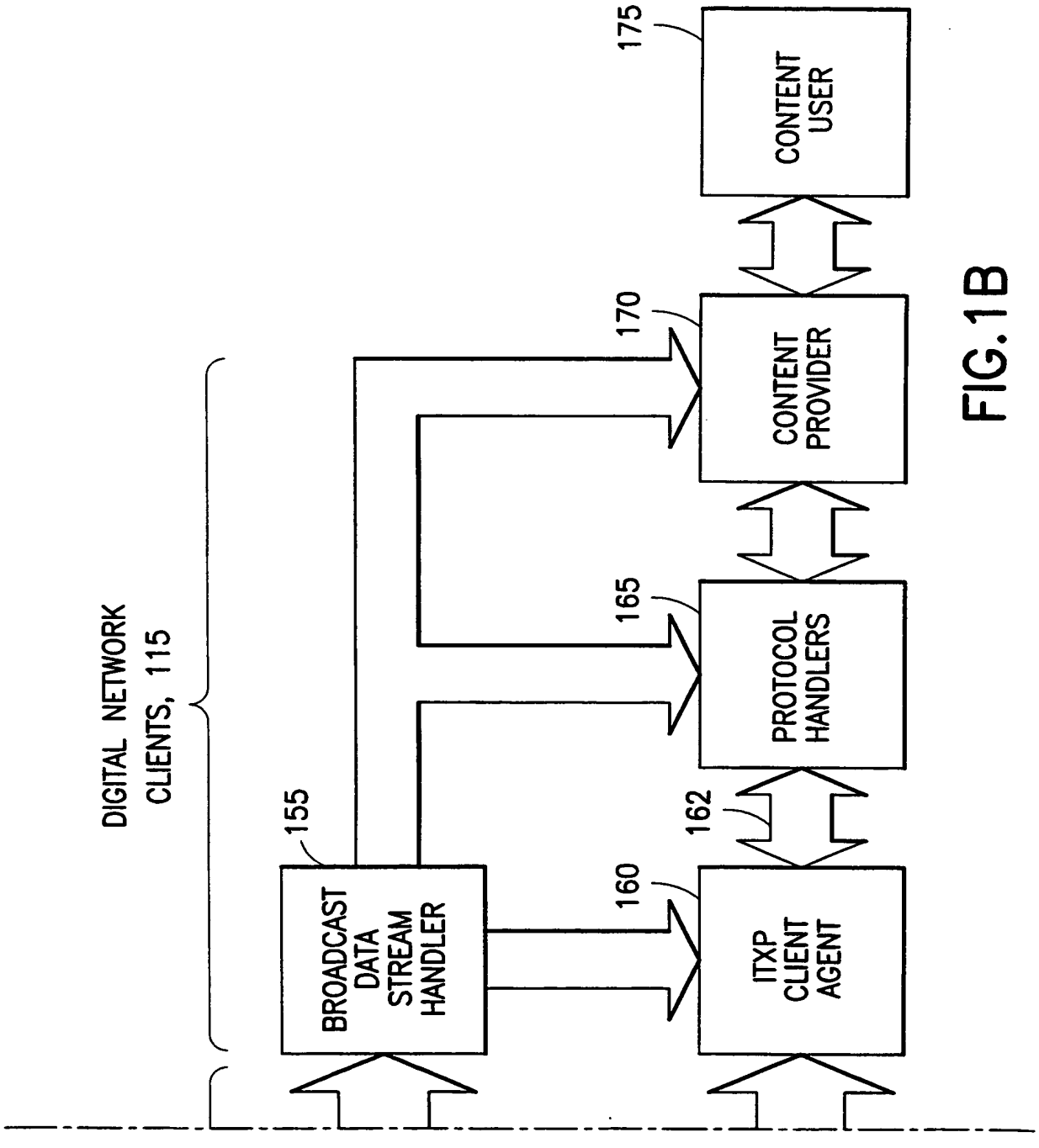
DIGITAL NETWORK CLIENTS, 115
BROADCAST DATA STREAM HANDLER
155
ITXP CLIENT AGENT
160
162
PROTOCOL HANDLERS
165
CONTENT PROVIDER
170
CONTENT USER
175

FIG.1B

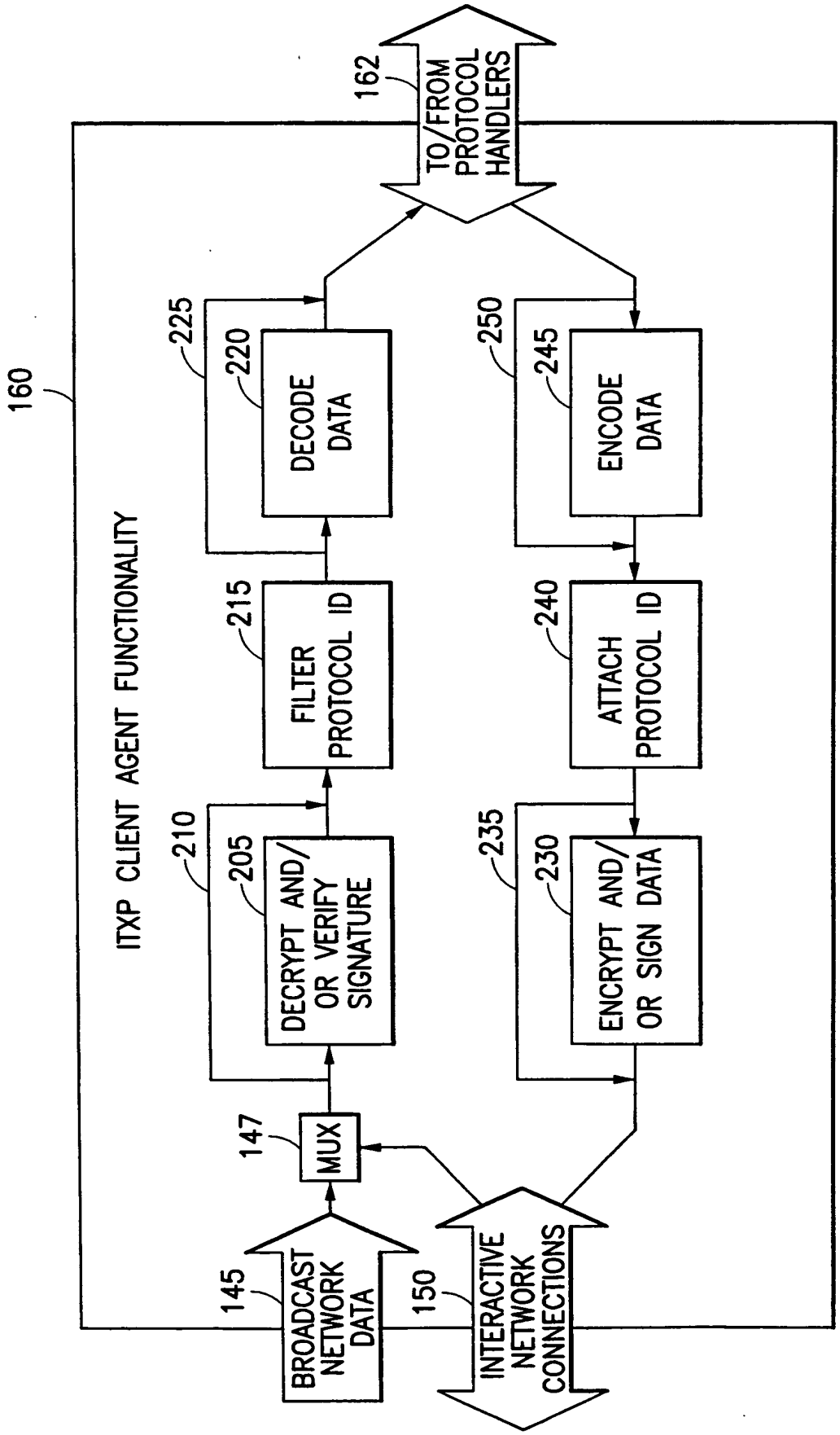
160
ITXP CLIENT AGENT FUNCTIONALITY
162
TO/FROM PROTOCOL HANDLERS
225
220
DECODE DATA
250
245
ENCODE DATA
215
FILTER PROTOCOL ID
240
ATTACH PROTOCOL ID
210
205
DECRYPT AND/ OR VERIFY SIGNATURE
235
230
ENCRYPT AND/ OR SIGN DATA
147
MUX
145
BROADCAST NETWORK DATA
150
INTERACTIVE NETWORK CONNECTIONS

FIG.2

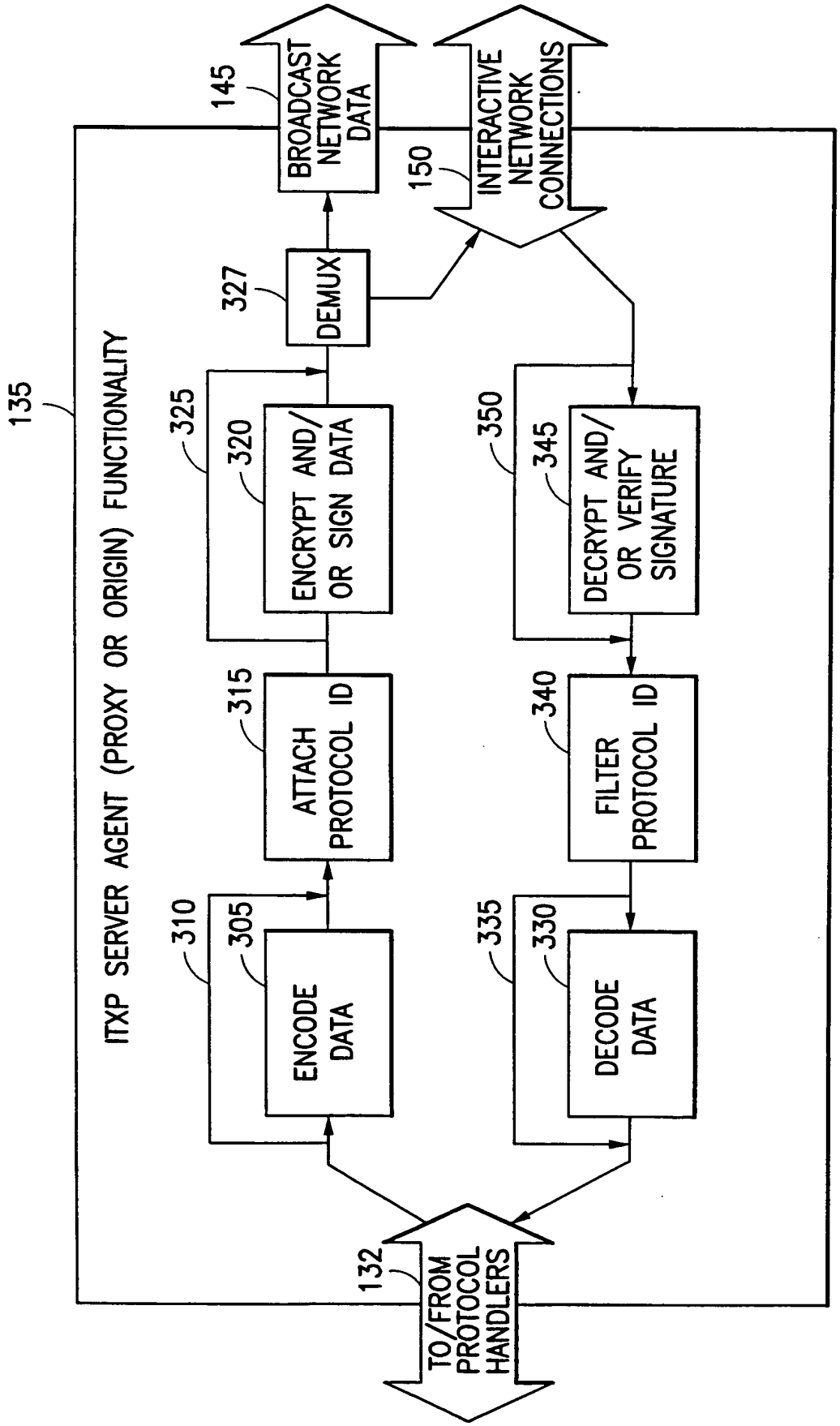
135
ITXP SERVER AGENT (PROXY OR ORIGIN) FUNCTIONALITY
145
BROADCAST NETWORK DATA
150
INTERACTIVE NETWORK CONNECTIONS
327
DEMUX
325
320
ENCRYPT AND/ OR SIGN DATA
350
345
DECRYPT AND/ OR VERIFY SIGNATURE
315
ATTACH PROTOCOL ID
340
FILTER PROTOCOL ID
310
305
ENCODE DATA
335
330
DECODE DATA
132
TO/FROM PROTOCOL HANDLERS

FIG.3

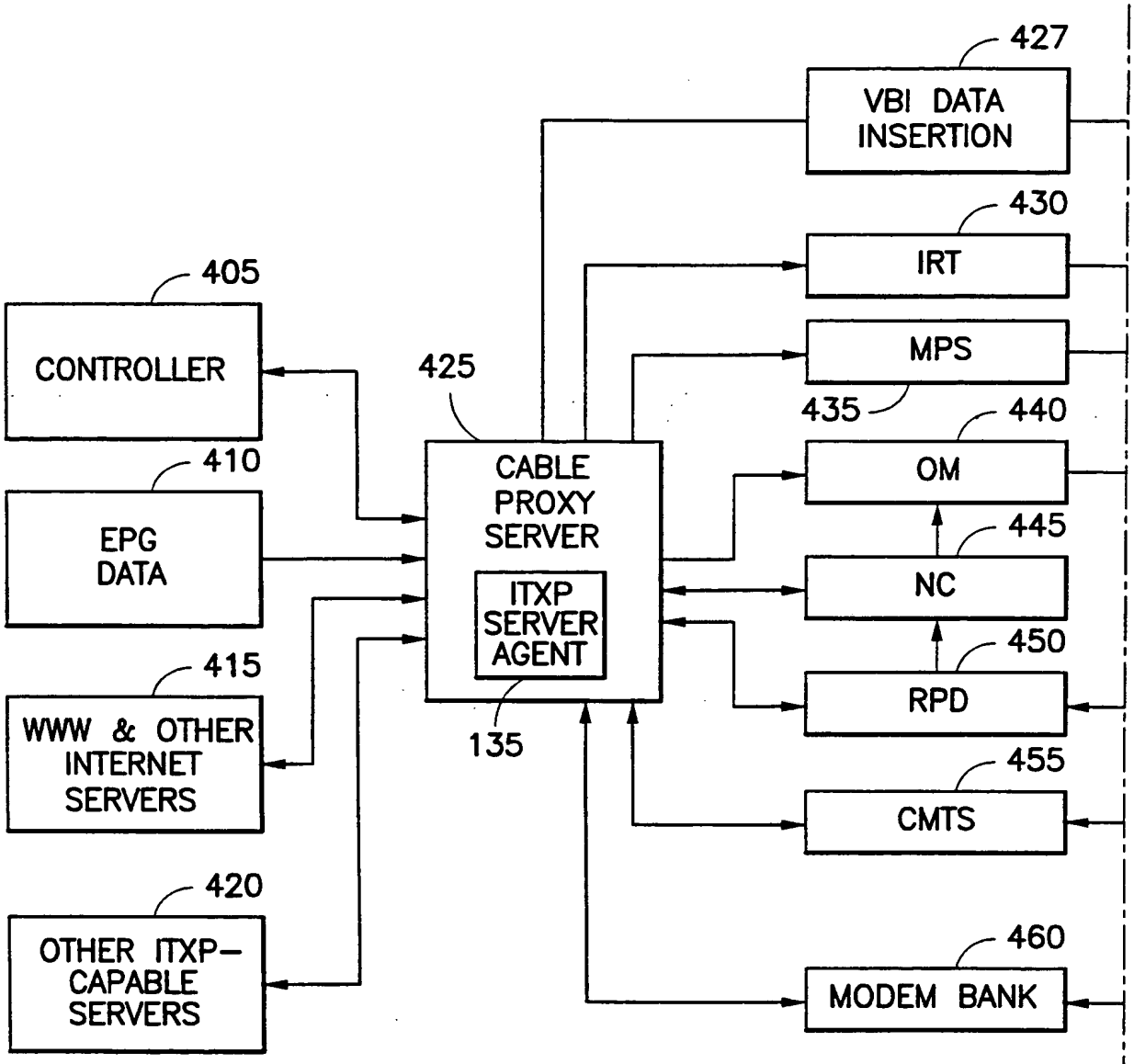

FIG.4A

FIG.4A	FIG.4B

FIG.4

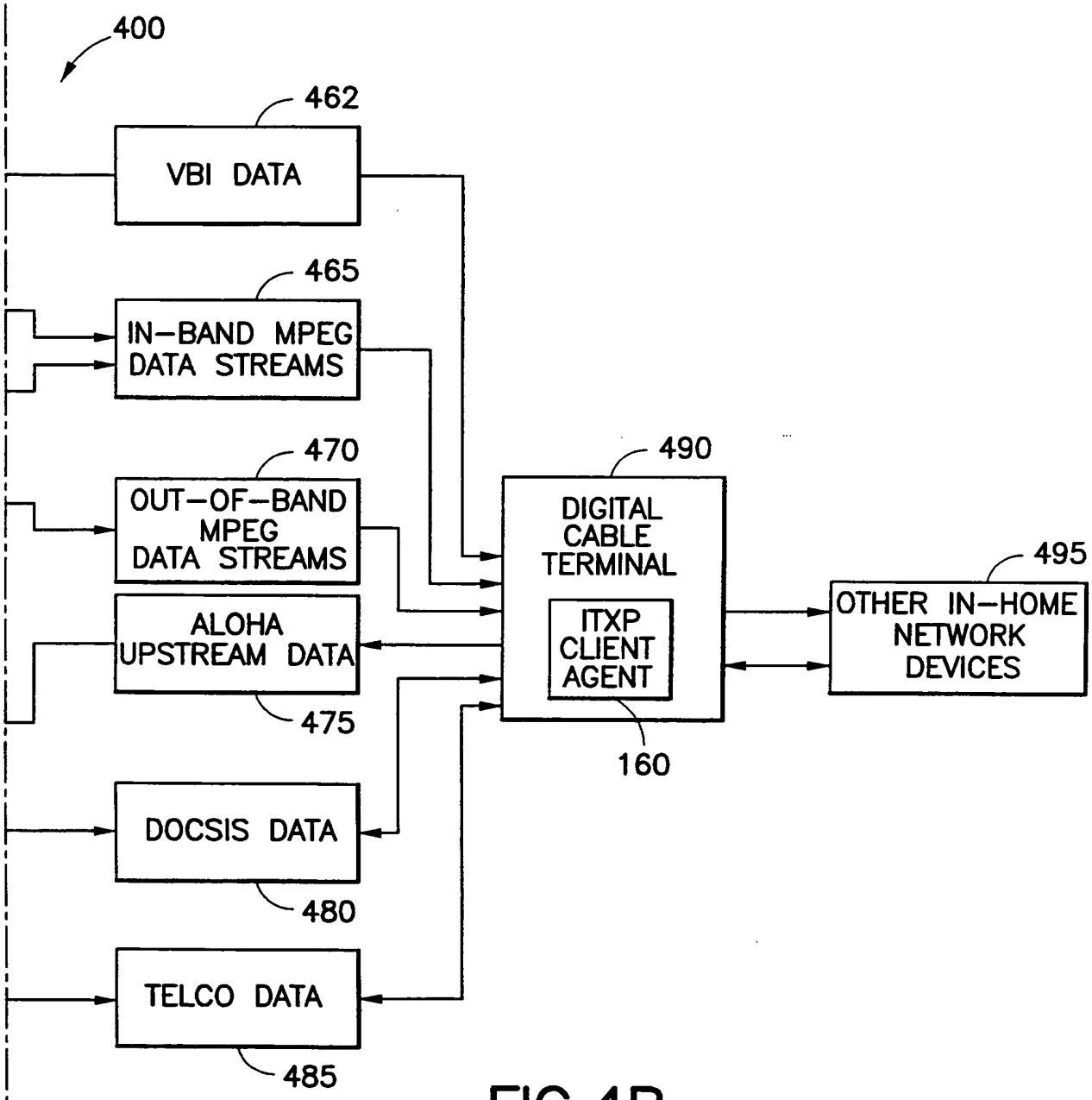
400
462
VBI DATA
465
IN-BAND MPEG DATA STREAMS
470
OUT-OF-BAND MPEG DATA STREAMS
ALOHA UPSTREAM DATA
475
DOCSIS DATA
480
TELCO DATA
485
490
DIGITAL CABLE TERMINAL
ITXP CLIENT AGENT
160
495
OTHER IN-HOME NETWORK DEVICES

FIG.4B

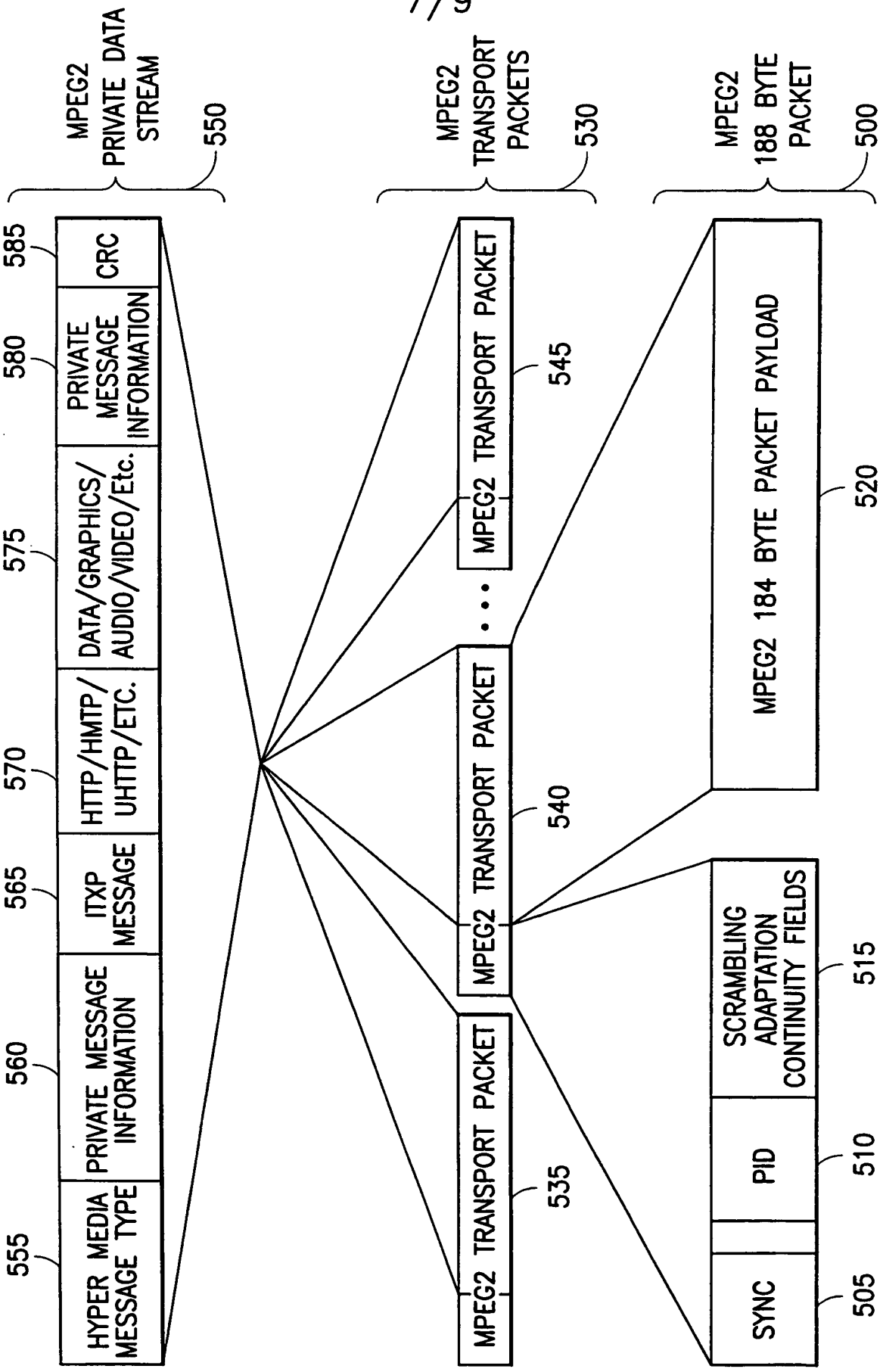
MPEG2 PRIVATE DATA STREAM
550
MPEG2 TRANSPORT PACKETS
530
MPEG2 188 BYTE PACKET
500
HYPER MEDIA MESSAGE TYPE
555
PRIVATE MESSAGE INFORMATION
560
ITXP MESSAGE
565
HTTP/HMTP/ UHTTP/ETC.
570
DATA/GRAPHICS/ AUDIO/VIDEO/Etc.
575
PRIVATE MESSAGE INFORMATION
580
CRC
585
MPEG2 TRANSPORT PACKET
535
MPEG2 TRANSPORT PACKET
540
MPEG2 TRANSPORT PACKET
545
MPEG2 184 BYTE PACKET PAYLOAD
520
SYNC
505
PID
510
SCRAMBLING ADAPTATION CONTINUITY FIELDS
515

FIG.5

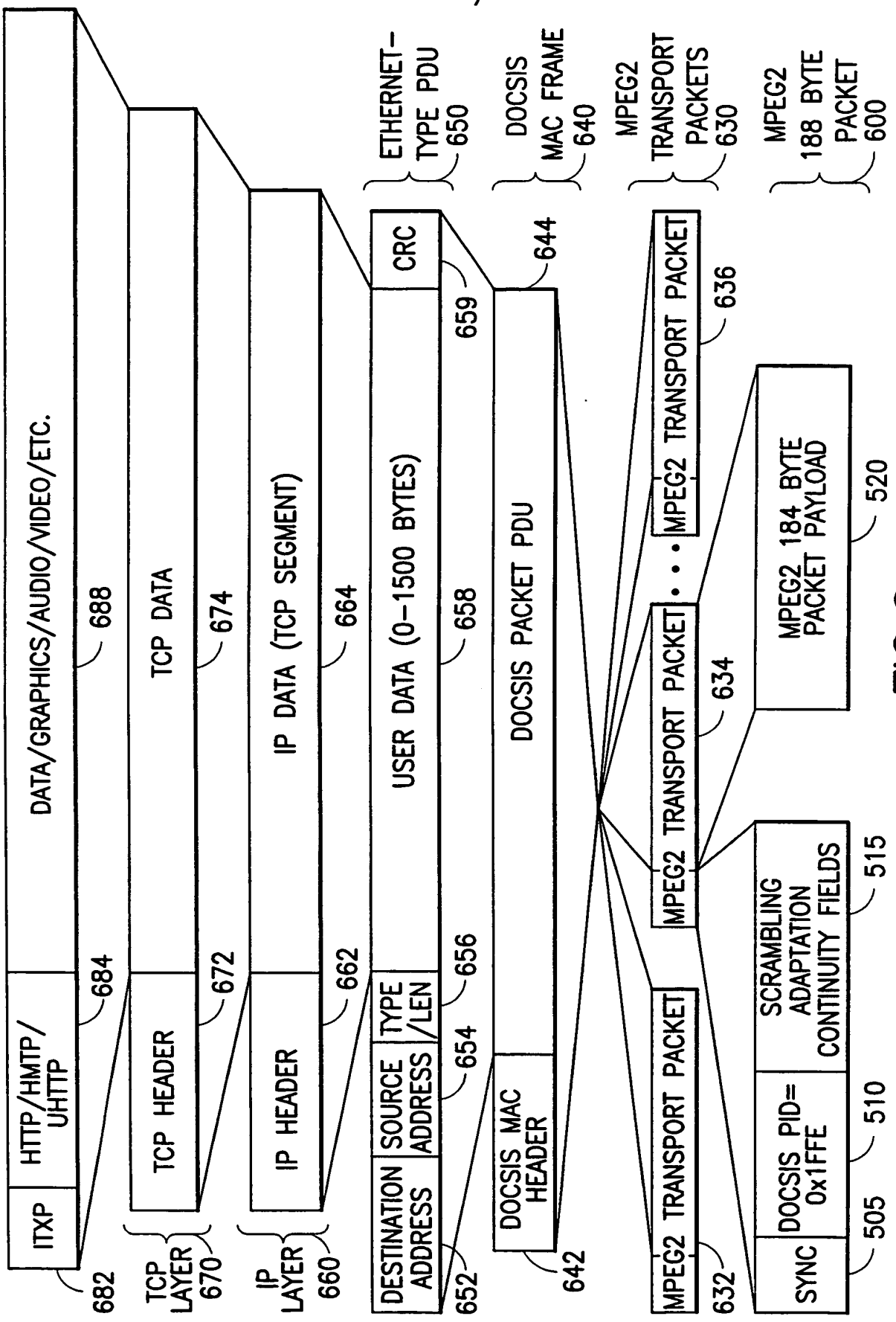
ITXP
HTTP/HMTP/UHTTP
DATA/GRAPHICS/AUDIO/VIDEO/ETC.
682
684
688
TCP LAYER 670
TCP HEADER
TCP DATA
672
674
IP LAYER 660
IP HEADER
IP DATA (TCP SEGMENT)
662
664
DESTINATION ADDRESS
SOURCE ADDRESS
TYPE /LEN
USER DATA (0-1500 BYTES)
CRC
652
654
656
658
659
ETHERNET-TYPE PDU 650
DOCSIS MAC HEADER
DOCSIS PACKET PDU
642
644
DOCSIS MAC FRAME 640
MPEG2 TRANSPORT PACKET
MPEG2 TRANSPORT PACKET
MPEG2 TRANSPORT PACKETS 630
632
634
636
SYNC
DOCSIS PID= 0x1FFE
SCRAMBLING ADAPTATION CONTINUITY FIELDS
505
510
515
MPEG2 184 BYTE PACKET PAYLOAD
520
MPEG2 188 BYTE PACKET 600

FIG.6

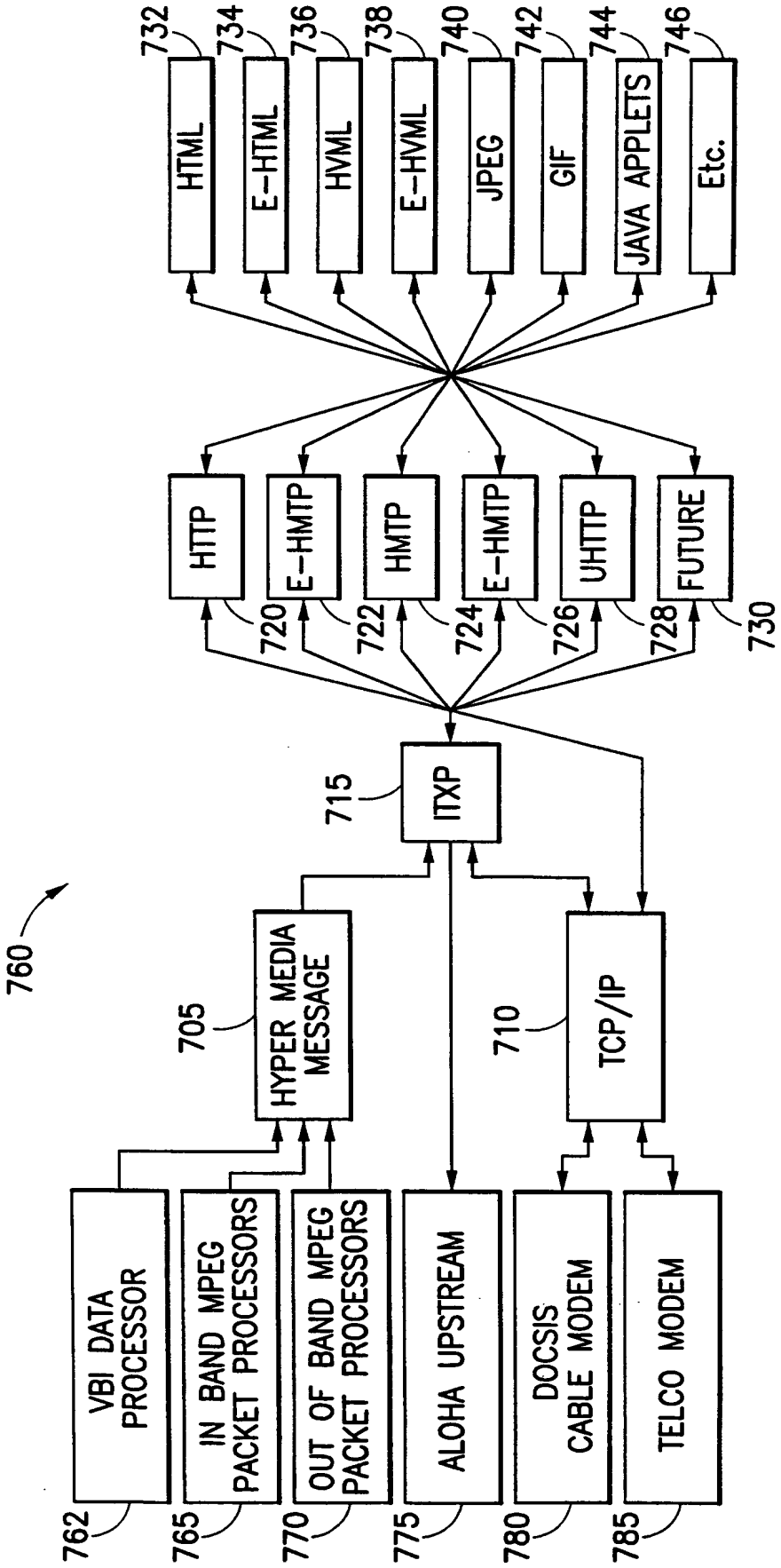
760
762
VBI DATA PROCESSOR
765
IN BAND MPEG PACKET PROCESSORS
770
OUT OF BAND MPEG PACKET PROCESSORS
775
ALOHA UPSTREAM
780
DOCSIS CABLE MODEM
785
TELCO MODEM
705
HYPER MEDIA MESSAGE
710
TCP/IP
715
ITXP
720
HTTP
722
E-HMTP
724
HMTP
726
E-HMTP
728
UHTTP
730
FUTURE
732
HTML
734
E-HTML
736
HVML
738
E-HVML
740
JPEG
742
GIF
744
JAVA APPLETS
746
Etc.

FIG.7

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(74) Agent: LIPSITZ, Barry, R.; 755 Main Street, Building No. 8, Monroe, CT 06468 (US).

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Published:
— *With international search report.*
— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

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1 February 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 00/67444 A3

(54) Title: METHOD AND APPARATUS FOR PROTOCOL CONVERSION

(57) Abstract: A protocol agent (135, 160) for a broadband communication network accommodates data that is provided using different protocols. Data is received from protocol handlers (130, 165) at a client (115) or server (105). An identifier (565, 682) is attached (240, 315) to the data (570, 684), to identify the protocol thereof, whether encoding was applied and, if so, which type, and whether encryption/signing was applied and, if so, which type. The data with the attached identifier is communicated, e.g., from a client (115) to a server (105), or from a server (105) to a client (115). Available communication paths include one-way, e.g., broadcast or multicast (462, 465, 470), or dedicated upstream path (475), and two-way, e.g., an interactive path such as a computer network or telephone link (485) using TCP or UDP, or a cable television upstream path (480). At the receiving end, the protocol identifier (565, 682) is filtered (215, 340) to apply decryption/signature verification, and/or decoding, and to forward the data to an appropriate counterpart protocol handler (130, 165).

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 00/10563

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 524 254 A (WALTON ANDREW ET AL) 4 June 1996 (1996-06-04)	1-4,13, 19,20, 23-27, 36,42, 43,46-49
Y	abstract column 1, line 20 -column 6, line 17 column 21, line 27 - line 51 --- -/--	5-12, 14-18, 21,22, 28-35, 37-41, 44,45

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 November 2000	29/11/2000

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Intern ıal Application No
PCT/US 00/10563

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	FORD W ET AL: "PUBLIC-KEY CRYPTOGRAPHY AND OPEN SYSTEMS INTERCONNECTION" IEEE COMMUNICATIONS MAGAZINE,IEEE SERVICE CENTER. PISCATAWAY, N.J,US, vol. 30, no. 7, 1 July 1992 (1992-07-01), pages 30-35, XP000307910 ISSN: 0163-6804 the whole document	5,6,28, 29
Y	O'NEILL A ET AL: "AN OVERVIEW OF INTERNET PROTOCOLS" BT TECHNOLOGY JOURNAL,GB,BT LABORATORIES, vol. 16, no. 1, 1998, pages 126-139, XP000736934 ISSN: 1358-3948 the whole document	7-12, 14-18, 21, 30-35, 37-41,44
Y	AKYILDIZ I F ET AL: "SATELLITE ATM NETWORKS: A SURVEY" IEEE COMMUNICATIONS MAGAZINE,US,IEEE SERVICE CENTER. PISCATAWAY, N.J, vol. 35, no. 7, 1 July 1997 (1997-07-01), pages 30-43, XP000695129 ISSN: 0163-6804 the whole document	22,45
A	GOLDBERG L: "ADSL TECHNOLOGIES: MOVING TOWARD THE LITE - AND BEYOND" ELECTRONIC DESIGN,US,PENTON PUBLISHING, CLEVELAND, OH, vol. 46, no. 24, 22 October 1998 (1998-10-22), pages 79-80,84,86,88,90,92,94-95, XP000859927 ISSN: 0013-4872 the whole document	
A	SMYTHE C: "NETWORKS AND THEIR ARCHITECTURES" ELECTRONICS AND COMMUNICATION ENGINEERING JOURNAL,GB,INSTITUTION OF ELECTRICAL ENGINEERS, LONDON, vol. 3, no. 1, 1 February 1991 (1991-02-01), pages 18-28, XP000208834 ISSN: 0954-0695 the whole document	
A	EP 0 767 563 A (SUN MICROSYSTEMS INC) 9 April 1997 (1997-04-09) abstract	1

2

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interna[redacted]ial Application No
PCT/US 00/10563

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5524254 A	04-06-1996	DE 69319757 D	27-08-1998
		DE 69319757 T	15-04-1999
		EP 0556148 A	18-08-1993
		JP 6085819 A	25-03-1994
EP 0767563 A	09-04-1997	US 5758186 A	26-05-1998
		AU 6552196 A	10-04-1997
		CN 1159631 A	17-09-1997
		JP 9218860 A	19-08-1997